

the last year or so. David Townsend, a Master Scientist, was previously moved to head a group working on Advanced Technology Products. Janet Wheeler has been made Manager of R&D Planning. It is worthwhile to note that there are two Program Managers who report to the Manager of Chemical Research: R. A. Heckman, Program Manager of Organic Chemistry, and a Program Manager of Radiochemistry. Despite the fact that there would appear to be a moderately sized organic chemistry group, we have recently learned that at this time there is only one practicing organic chemist at the RJR Research Center. This individual is Dwo Lym, who is currently working in the area of radiolabelled synthesis. It is not known at this time whether the organic chemistry group has been disbanded, or if the members of the group are working on other projects. We do know that Tom Perfetti, who is currently listed as a member of the organic chemistry group and is a Master Scientist, is no longer working in this area.

New Product Technology is Divided into two Directorates: Product Technology & Development, and Process Technology & Development. Product Technology & Development has four Divisions: Mechanical Fabrication, Applied Packaging Technology, Materials Development, and Development. M. G. Woempner is the Group Manager of Mechanical Fabrication, J. P. Butler is the Manager of Applied Packaging Technology, L. H. O'Connor is the Manager of Materials Development, and M. D. Shannon is the Manager of Development. Process Technology & Development is divided into five Divisions: Process R&D, Manufacturing Process Engineering, Process Development, Process Engineering, and Optical Technology. D. R. Pugh is the Director of Process Technology & Development, G. D. Culp is the Manager of Manufacturing Process Engineering, and R. A. Merricks is the Program Manager of Process Engineering.

Administrative & Technical Services is divided into two Directorates: Technical Services and Administrative Services & Agricultural Sciences. Technical Services is divided into four Divisions: Scientific Information, Analytical Services, Quality Assurance and R&D Planning. H. C. Threatt is the Director of Technical Services, B. T. Hodge is the Manager of Analytical Services, and J. P. Wheeler is the Manager of R&D Planning. C. T. Mansfield, who reports to the Manager of R&D Planning, handles the RJR R&D competitive intelligence function. Administrative Services & Agricultural Sciences is divided into three Divisions: Safety/Maintenance Engineering, Agricultural Sciences, and Personnel Administration. B. V. Hardin is the Director of Administrative Services & Agricultural Sciences, D. L. Davis is the Manager of Agricultural Sciences, and S. Clapp is the Manager of Personnel Administration.

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The full organization chart for the RJR Tobacco Research Center is included at the end of this section (Attachment 1). Also included is a complete list of all of their R&D employees, in alphabetical order, including individuals who have since left the company as well as individuals who have not yet been assigned to a specific group within the organization.

Two other points we have learned about the R&D organization are worth noting. The first is that as we had previously surmised, the R&D Computer Application Division is quite small compared to PM USA. The group consists of a total of about twelve individuals, two-thirds of which are professionals. The other point is that the RJR Research Center is now organized by major programs, seemingly much as is the PM USA Research Center. There are about ten major programs. Chemical Senses is one of the major programs. We do not have firm identification of any of the others; however, we can surmise that an optical processing program, aerosol research, and two or three product and process development programs are included.

6. Patents and Publications

Reynolds continues to be extremely active with respect to patenting. In the twelve month period from July 1, 1990, to June 30, 1991, they had 41 issued US patents, 14 EPO Publications, 1 Canadian patent, and 1 UK patent. The speculation made last year that the small number of EPO Publications assigned to Reynolds suggested a decline in patents for future years does not seem to have been borne out as of yet. The category with the largest number of patents is still improvements to Premier (8 US patents and 3 EPO Publications). There are five US patents in the area of on-line inspection devices. These patents include techniques such as optical inspection devices, infra-red radiation for the detection of loose ends, a sensing device to detect metal in a cigarette, and a near infra-red technique to determine menthol. The only other category with more than four patents involves non-burning articles, with two US patents covering electrical devices and three US patents covering chemical devices.

Several of these patents are of strategic importance. The two US patents describing electrical devices, US 4,947,874 and US 4,947,875, describe essentially identical devices with different uses. US 4,947,874 teaches the use of the device as an "electric cigarette," while US 4,947,875 describes the article as an aerosol delivery device. Reynolds continues to work in the area of reduced sidestream smoke cigarettes. One of the patents, US 4,941,485, describes a low sidestream cigarette which uses what is essentially the Ecusta magnesium hydroxide low sidestream wrapper, while US 4,998,541 claims a wrapper similar to that used above with the incorporation

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of an alkali metal salt in the wrapper. A patent of particular significance, US 4,941,486, covers the use of any thermally labile flavor-release system applied to cigarette paper for the purpose of modifying sidestream aroma. This patent is of concern to PM USA because it has extremely broad coverage. US 4,979,521 claims a method for the high speed manufacture of cigarette rods of controlled integrity by way of a process which introduces water through the tongue. US 4,962,774 teaches a method for the production of reconstituted tobacco with ammonia incorporated therein, an area which has been of interest to PM USA for some time. US 4,962,773 describes a method for expanding tobacco after the cigarettes have been made using supercritical propane, while US 5,012,826 describes a similar method using a mixture of supercritical propane and carbon dioxide. US 4,971,077 teaches a method for on-line monitoring of menthol in tobacco using a near infra-red technique. US 4,995,405 discloses a technique for directly inserting a liquid into the tobacco during cigarette manufacturing. This is the second patent claiming such a method that Reynolds has obtained. EP 404,473 teaches a method for expanding tobacco using sulfur hexafluoride.

There is a group of four EPO Publications (419,733; 419,974; 419,975; and 419,981) which describe smokable fillers - mixtures of tobacco with other materials such as calcium carbonate, pyrolyzed cellulose, etc. These patents are of interest because the cigarettes claimed using these fillers are specified to have low porosity wrappers (5 Coresta). Since no claim for reduced sidestream smoke is made for these cigarettes, it is reasonable to assume that the low porosity wrappers are used to provide lower burn rate and, therefore, lower ignition propensity. It is possible that RJR may attempt to use an "extended" tobacco in low burn rate cigarettes, if such cigarettes are mandated, in order to cut costs. A list of all of the RJR patents classified by subject is shown in Table 3.

R. J. Reynolds had 23 publications for the period starting on July 1, 1990. The three areas with the most publications are toxicology (5), analytical chemistry (4), and smoke chemistry (4). Two of the toxicology papers and two of the smoke chemistry papers deal with Premier. The subjects of the remaining publications are as follows: biochemistry (3), chemical senses (2), entomology (1), ignition propensity (1), nitrosamines (1), aerosol research (1), and ETS (1). It is interesting to note the fact that there was only one ETS publication. It should also be noted that the ignition propensity publication is the first on this subject from RJR.

Reynolds may be doing more than simply publishing in the area of ignition propensity (also, see above). A recent Winston Lights model which was mail-out

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Table 3
RJR Tobacco Patents from July 1, 1990, to June 30, 1991

Premier Type Articles 8 US Patents 3 EPO Publications	Expanded Tobacco 3 US Patents 1 EPO Publication
Non-Burning Articles 5 US Patents	On-Line Inspection Devices 5 US Patents
Reduced Sidestream Cigarettes 3 US Patents	Sidestream Odor Modification 1 US Patent
Reconstituted Tobacco 2 US Patents	Tobacco Processing 3 US Patents
Smokable Fillers 4 EPO Publications	Cigarette Manufacturing Technology 2 US Patents
Solvent Removal of Nicotine 1 US Patent	Chemical Senses 1 US Patent
Cigarette Testing Equipment 1 US Patent	Tobacco Processing Equipment 1 EPO Publication
Tobacco Sparging 1 US Patent	Variable Dilution Filter 1 US Patent
Cigarette Filters 1 US Patent 2 EPO Publications	Advertising Devices 1 US Patent 1 UK Patent
Automated Warehouse Placement System 1 EPO Publication	Automated Cargo Loading System 1 US Patent
Tobacco Extracts 1 EPO Publication	Tobacco Testing Equipment 1 US Patent 1 EPO Publication 1 Canadian Patent

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tested in June used a wrapper with a base porosity of 10 Coresta (calculated) which had been perforated to 120 Coresta. This base porosity was calculated using the PM USA R&D design program and adjusting the base porosity, after all other changes were made, to best approximate tar delivery, nicotine delivery, and puff count. Despite the fact that this cigarette contains no expanded tobacco, calculated mass burn rate has decreased from 57 to 45 mg/min. It is likely that the wrapper was perforated in an attempt to improve the subjectives of a cigarette which utilizes a low porosity paper. The observed cigarette delivery and construction parameters for a standard Winston Lights KS and the cigarette used for mail out testing, as well as the calculated values using the design program, are given in Table 4. The possibility of RJR beginning to move toward low ignition propensity cigarettes should be monitored carefully.

RJR's technical strategy appears to be somewhat better defined by their patents than it has been in previous years. One observation that is quite striking is the number of patents, utilizing a number of different techniques, dealing with on-line monitors. It would appear that they consider process monitoring within their factories to be a strategic goal. They also have devoted considerable effort to the area of tobacco processing to obtain natural tobacco "flavor concentrates." This material could be utilized in a Premier type article, a non-burning article, an ultra-low delivery cigarette, or a low burn rate cigarette. They continue to patent new aspects of a Premier type article. It would appear that they are continuing to work in this area and still consider the development of a product of this type to be a strategic goal.

7. RJR Products Using New Technology

RJR is clearly working in three areas involving products which incorporate new technology. The first, which is already in test market, is Horizon - a product which incorporates a flavor-release agent in the cigarette paper (ethylvanillin glucoside) which releases ethylvanillin to produce a vanilla odor in the room when these cigarettes are smoked. The specific technology used in Horizon was actually developed by Ecusta, although Reynolds had done some work in the area of flavor-release compounds in the past. The fact that they had worked in this area at one time allowed them to obtain broad patent coverage on this technology which may cause problems for PM. The second type of product is a low sidestream cigarette. We are aware of the fact that Reynolds mail-out tested at least one low sidestream cigarette in late 1990 or early 1991. Once again, the technology utilized for this product was developed at Ecusta, and once again Reynolds was able to obtain patent coverage, although specific coverage, on Ecusta's technology. Lastly, as mentioned above,

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Table 4
Observed and Calculated Data for an Unidentified 84 mm Cigarette
Mail-Out Tested by RJR

	Winston Lights King Size (84 mm) Cigarette Observed	Unidentified King Size (84 mm) Cigarette Observed	Unidentified King Size (84 mm) Cigarette Calculated
Butt Length (mm) ¹	38	38	38
FTC Tar (mg/cigt)	9.1	10.4	9.8
Nicotine (mg/cigt)	0.66	0.79	0.72
Puffs/cigt	7.3	8.8	9.5
Cigarette RTD (mm H ₂ O)	120	114	114
Cigarette Length	83.7	83.7	83.7
Static Burn Time (min) ²	7.8	ND ³	10.2
Mass Burn Rate (mg/min) ²	57	ND	45
Circumference (mm)	24.9	24.8	24.8
Wrapper Component Type	cit	ND	cit
Component Percent	0.4	ND	0.4
Permeability (Coresta)	36	120 ⁴	120 (10)
Filter Type	CA	CA	CA
RTD (mm H ₂ O)	95	108	100
Filter Length (mm)	26.9	26.7	26.7
Weight (g)	0.17	0.17	0.17
Fiber denier	2.8	3.2	3.2
Ventilation (%)	18	22	22
Tobacco Weight (g)	0.627	0.657	0.657
Rod Density (g/cc)	0.224	0.233	0.236
ET (%)	12	None	None

¹ The presence of overtipping yields an effective butt length of 38 mm; the Winston Lights KS was smoked to 38 mm, and the calculation was done on the same basis.

² Calculated for Winston Lights KS.

³ ND = not determined.

⁴ Paper is perforated to 120; base paper Coresta calculated to optimize tar and puff count.

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Reynolds continues to work on Premier. It is worthwhile noting that Reynolds appears to be depending heavily on vendors, and other outside sources, to develop much of their technology.

8. Strengths and Weaknesses

A list of strengths and weaknesses is shown in Table 5. RJR continues to remain strong in the areas of toxicology/biochemistry, biobehavioral science, analytical chemistry, and process development. They have expanded their efforts in optical inspection devices to cover several different types of on-line inspection. They have also devoted considerable time and effort to the area of nicotine pharmacology. As mentioned above, they are apparently discontinuing their effort in ETS; consequently, this item has been removed from the list of strengths.

RJR's R&D Center continues to remain weak in both organic and inorganic chemistry. The effort devoted to materials science that had been built up during the work on Premier has been eliminated, and many of the staff members working in this area are no longer with the company. They still depend on their vendors for the vast majority of research and development efforts involving cigarette and tipping papers. We have suspected for some time that RJR had discontinued their excellent work in the area of natural products chemistry, and that fact was confirmed this year. RJR continues to force their suppliers to adopt pricing policies which provide RJR the most favorable terms. In addition, RJR has made a number of product changes to save money. Not only have they converted the majority of their products from flax to wood pulp paper, they have also substituted sorbitol for glycerine in order to lower costs. Lastly, we have considerable evidence that morale at the Research Center is extremely low. The staff is concerned that additional lay-offs could come at any time, and there is also concern that on-going programs could be discontinued. As a matter of fact, morale throughout all of RJR is poor. There have been problems in the factories caused by employees contaminating tobacco with items such as plastics. RJR has recently adopted a policy for all visitors to their factories that no item, other than prescription eyeglasses, can be carried in their shirt pockets.

9. Conclusions

It would appear that RJR Tobacco is more vulnerable now that they have been in at least five years. It is true that they have managed to do a number of things quite well. They have been particularly astute in managing the finances of the company. RJR has been able to retire a considerable amount of high interest debt. Since June, 1990, the company has retired \$9 billion of its highest coupon debt.

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Table 5

RJR Tobacco R&D Strengths and Weaknesses

Strengths:

Toxicology/Biochemistry

Biobehavioral Science

Analytical Chemistry

Process Development

On-Line Inspection Devices

Nicotine Pharmacology

Weaknesses:

Organic and Inorganic Chemistry

Materials Science

Paper Technology

Natural Products Chemistry

Relationships with Suppliers

Staff Morale

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RJR's debt-to-total-equity ratio now stands at 2.7:1, down from 4.4:1 at the end of 1990. They have accomplished this not only through the issue of lower interest debt including preferred stock, but also through the issue of common stock (725 million shares since 1990) which is currently paying no dividend. These moves have reduced their debt services payment from \$1,554,000,000 in the first six months of 1990 to \$1,142,000,000 in the first six months of 1991. In addition they have an advantage over PM with respect to their cost in producing cigarettes. A study conducted last year indicated that RJR has variable production costs \$0.47/thousand less than PM USA. They remain committed to growing their tobacco business. James Johnston, CEO of RJR Tobacco, has publicly stated that RJR Tobacco's ten year goal is to pass Philip Morris in the sale of full margin cigarettes by the end of the 90's. They are clearly continuing to maintain an active Research Center; however, there is evidence that significant cutbacks will occur.

Despite these positive factors, there are considerable problems. It has already been mentioned that RJR Tobacco's sales, particularly for full margin brands, are down considerably. Therefore, the money saved through reduction of debt has had little impact due to money lost because of decreases in sales. RJR's product strategy during the past twelve months has not been particularly successful; whereas, Philip Morris's strategy would appear to be quite successful. RJR has been forced to spend considerable money in introducing a rather large number of brands both nationally and in test market. None of these introductions, at this time, appear to be winners. Although it is too early to predict how well Marlboro Medium will do, initial indications are quite promising. Although the majority of those who switch into Marlboro Medium may already be Marlboro smokers, there is reason to believe that the brand will attract a number of Reynolds smokers as well. The strategy behind the introduction of Cambridge and Bristol Lowest appears to be working. As soon as these cigarettes were introduced into Region 2, RJR started promoting Now with \$2.00 coupons. This is the first time RJR has ever couponed Now, and it represents a loss of \$10.00/thousand. The frequent and extensive reformulation of their current brands could pose a problem. If Reynolds smokers feel that their cigarette has changed, they may be more inclined to try other brands. Lastly, RJR is not positioned well internationally. Their direct export business has not kept pace with PM or B&W, and they are clearly not getting their share of the growing international market. RJR's world market share estimated for 1990 was only 4.9% compared with 11.0% for PM. Although they reported a 28% gain in international sales for the first six months of 1991, this figure reflects dollar sales value rather than units, and it is influenced by price increases and exchange rate fluctuations. They are also not taking advantage of any synergies which might have been expected when the International laboratory was moved to Winston-Salem. The two businesses are run completely

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separately, and no attempt is made to minimize differences for brands which are marketed both domestically and internationally. Consequently, RJR is not in a position to claim that Winston is consistent throughout the world as PM has managed to do with Marlboro.

As a consequence of all of the above, it would seem reasonable to recommend that PM USA adopt an aggressive strategy vis a vis Reynolds' brands. We have already completed product development work in the area of ultra low delivery products which will force Reynolds to protect Now. We should be equally aggressive in the production and marketing of a non-filter price value brand which will force them to protect Camel non-filter. Other possibilities would be the repositioning of a full margin brand marketed so as to take share from Camel, and a third tier menthol brand positioned to take share from Salem.

B. Brown & Williamson

1. Highlights

Brown & Williamson has had a financially successful year to date, as did its parent company BAT. First quarter results for BAT showed an increase in sales of 2% compared to the first quarter of 1990, an increase in pre-tax profits of 40%, and an increase in earnings per share of 45%. Worldwide cigarette volume for BAT rose by 2%, and their share of the global market has increased to 10.3%. Although BAT's CEO has warned shareholders that second quarter results may not be quite as good as the first quarter results, he also indicated that the company should do quite well for all of 1991.

Despite a good financial performance, B&W's market performance has suffered. Brown & Williamson has had the second largest decline in unit sales among domestic manufacturers for the first half of 1991. As expected, a sharp decrease in full margin sales is responsible for this decline. B&W has recently announced plans to test market a "Kool Classic" with a new advertising campaign in the near future. B&W is particularly active in direct export. Approximately 40% of the cigarettes manufactured in the US are exported. Plans are to increase their penetration into the Eastern European market.

Brown & Williamson has been more active with respect to new product introductions than they were last year. The most significant introduction involved the repositioning of Raleigh to the sub-generic category. All of the new product introductions will be discussed below.

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Both BAT and B&W continue to stress lowering costs of cigarette manufacturing. In the year-end summary from BAT's CEO, Sir Patrick Sheehy, it was stated that: "Our facilities in Southampton, England, and Macon, USA, are now amongst the most modern in the world. Indeed, the cost of converting raw materials into finished cigarettes at Southampton is now 33% lower in real terms than in 1980."

2. New Products

a. New Product Introductions - Brown & Williamson has introduced the following new products domestically during the past twelve months.

(1) Raleigh Extra 100 and Raleigh Extra Lights 100 (plain and menthol) cigarettes were introduced in New York in September, 1990. Raleigh Extra 100 delivers 15 mg tar and 1 mg nicotine; Raleigh Extra Lights delivers 12 mg tar and 0.8 mg nicotine; Raleigh Extra Lights Menthol delivers 9 mg tar, 0.7 mg nicotine, and 0.2 mg smoke menthol. These products sell at a sub-generic price:

(2) Viceroy King Size and Viceroy Lights King Size cigarettes were introduced in Louisiana in January, 1991, in box packings. Viceroy King Size delivers 17 mg tar and 1.1 mg nicotine. Viceroy Lights King Size delivers 12 mg tar and 0.8 mg nicotine. These products sell at a generic price.

(3) Raleigh Extra Ultra Lights King Size and 100 cigarettes were introduced nationally in May, 1991. Both products deliver 6 mg tar and 0.4 mg nicotine. These products are being sold at sub-generic prices.

(4) Viceroy 100 and Viceroy Lights 100 were introduced into California and Hawaii in June, 1991, in box packings. Viceroy 100 delivers 17 mg tar and 1.2 mg nicotine. Viceroy Lights 100 delivers 12 mg tar and 0.9 mg nicotine. These brands are being sold at generic prices.

In addition to the product introductions listed above, Brown & Williamson has also introduced Barclay King Size Box cigarettes in Kentucky in September, 1990, and Kool King Size Box and Kool Milds King Size Box cigarettes nationally in January, 1991. These 83 mm brands will probably take the place of the Long Size Box products already on the market.

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b. **New Brand Performance**

Of the four new product introductions listed above, two involve the expansion of the Raleigh Extra family. Raleigh Extra was positioned as a sub-generic in 1990, and has been doing reasonably well. In the third quarter of 1991 it held a 1% market share.

The other two Brown & Williamson test markets opened in the past twelve months involve box packings of Viceroy King Size, Viceroy Lights King Size, Viceroy 100's and Viceroy Lights 100's. Clearly the intention in this case is to increase sales of these brands by offering consumers box packings as well as soft packs.

3. **Brown & Williamson Brand Performance**

Although BAT's first quarter earnings showed a significant increase, B&W's sales showed a 4.1% decline during the first six months of 1991 compared to the same period in 1990. This was the second largest decrease in the industry. Most of this decline can be attributed to Kool (19.6%). B&W's price value increase has also been below the remainder of the industry (24%), but it is significantly better than Reynolds.

4. **R&D Organization**

There has been little change in the size of the B&W Research Center in Louisville according to published estimates. The 1991 edition of the "Directory of American Research and Technology" cites a total size for the Research Center of 215 which includes 156 professionals, 19 of whom are doctorates, and 59 technicians and auxiliaries. This number is essentially unchanged from the previous year's directory. On the other hand we were informed in early spring, 1991, that B&W had offered their R&D Department a very favorable early retirement program. Of the 30 people eligible, 18 individuals actually took the offer. Among those retiring were Lance Reynolds, Vice President Research Services; Jim Nall, Director of Technical Services; Phil Fischer, Manager of Blend Development; and Bob Johnson, Principal Scientist. Apparently, more people took early retirement than B&W had anticipated, and many of these individuals are now acting as consultants.

Perhaps as a consequence of more personnel opting for early retirement than was expected, B&W is currently hiring. There were advertisements for four positions in the August 19, 1991, issue of Chemical and Engineering News. The positions

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advertised for were: 1) a Ph.D. research chemist/physicist with experience in physical testing and thermal analysis; 2) a Ph.D. research chemist with experience in gas chromatographic/mass spectrometric analyses; 3) a Ph.D. research chemist with experience in gas chromatographic/mass spectrometric methods development; and 4) a B.S. development chemist. None of these positions give any indication that B&W is becoming involved in new areas of technology. An earlier advertisement appeared in the April 8, 1991, edition of Chemical and Engineering News. The text of this ad suggested that the individual to be hired would be working in the flavor area.

The B&W Research Center is directed by J. S. Wigand, Vice President, Research and Development. Three directors report to Wigand: A. McMurtrie, Director of Product Development, and Directors of Research Services and Technical Services. Product Development is divided into six Divisions, each headed up by a manager. The six Divisions are: Blend Development, R. Wilson, Manager; Filter Development, F. K. St. Charles, Manager; Development Center, B. Bandy, Manager; Cigarette Design; International Product Development; and Packaging, K. A. Flaherty, Manager. Technical Services is divided into five Divisions, each headed by a manager, which are: Product Evaluation; Statistics, P. L. Chen, Manager; Technical Project Planning, A. J. Golub, Manager; Cigarette Intelligence; and Technical Information, A. Diesing, Manager. Lastly, Research Services is divided into three Divisions which are: Analytical Methods, J. H. Lauterbach, Manager; New Technologies, R. H. Honeycutt, Manager; and Microbiology. It should be noted that the Process Development (Engineering) Directorate is no longer in R&D in Louisville, but was moved to Macon, Georgia, about two years ago.

The full organization chart for the Brown & Williamson Research Center is included at the end of this section (Attachment 2). Also included is a complete list of all of their R&D employees, in alphabetical order, including individuals who have since left the company as well as individuals who have not yet been assigned to a specific group within the organization. It has been considerably more difficult to obtain information regarding Brown & Williamson's Research Center than it has for Reynolds. B&W is not active in publishing, nor are they as well represented at technical meetings. They are also less likely than Reynolds to issue press releases regarding, at least, R&D personnel.

5. Patents and Publications

BAT continues to patent aggressively. During the twelve month period from July 1, 1990, to June 30, 1991, the three laboratories - B&W, BAT UK, and BAT GmbH - issued 41 patents. The total included 16 US Patents, 6 European Patent Office

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Publications, 10 German Patents, 8 Canadian Patents, and 1 Japanese Patent. Division by laboratory was as follows: 10 from Brown & Williamson, 12 from BAT UK, and 17 from BAT GmbH. Only four technology areas had more than two patents. BAT is still attempting to establish at least a defensive position with regard to Premier, and had a total of 8 patents claiming articles of this type. As before these patents appear to be concept patents only. There is no evidence that any of the devices claimed have actually been built, and in many cases it would appear virtually impossible to do so. BAT had a total of five patents in the tobacco processing area, three patents in the packaging engineering area, and three patents claiming varieties of a coaxial cigarette. It is not clear from the latter patents if they actually intend to attempt to market such a product. Lastly, BAT continues to be active in the area of low sidestream cigarettes. The complete list of BAT patents classified by subject matter is shown in Table 6.

Several BAT patents warrant further comment. US 4,934,524 teaches a package for storing moisture laden articles (cigarettes). This patent is virtually identical to a PM USA patent on the "humidor pack." US 4,938,235 claims a separator for separating tobacco particles from a tobacco/gas mixture. The technology disclosed in this patent could conceivably be applied to a number of current PM USA tobacco expansion processes. Further evaluation of this patent is in progress. US 4,977,908 teaches a water expanded reconstituted tobacco process using an extrusion approach which is almost identical to two PM USA patents except that the moisture levels utilized are different. PM claims a moisture level of 15-50%, while BAT claims a level of 5-15%. We are currently monitoring BAT products to determine if they are using any expanded reconstituted tobacco. US 4,986,287 claims a coaxial cigarette which is claimed to change mass burn rate without affecting static burn rate. This technology, if it is actually real, would clearly have an application to the development of a low ignition propensity cigarette. US 5,024,351 describes a device which may be used as a coupon dispenser. EP 291,104 discloses a pectin based adhesive. This technology is also being investigated further. The last two patents worth mentioning are noteworthy not because new technology is disclosed, but because very old technology has been patented. Both of these patents, EP 383,018 and JP 02-39,873, claim the use of filters containing carboxylic acids incorporated into them for the selective reduction of nicotine in smoke. More will be said regarding BAT's patent policy below.

For the past two years analysis of BAT's patents had indicated that they were pursuing a strategy primarily involving increasing efficiency in the factory and improving quality. There is little of either of these two elements present in BAT's most recent patents. It would appear that one of their chief strategies is to

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Table 6
BAT Patents from July 1, 1990, to June 30, 1991

Premier Type Articles	Tobacco Processing
3 B&W	3 BAT UK
5 BAT GmbH	2 BAT GmbH
Coaxial cigarette	Expanded Tobacco
1 B&W	1 BAT UK
2 BAT GmbH	1 BAT GmbH
Reduced Sidestream Cigarettes	Packaging Engineering
3 BAT UK	3 B&W
Non-Burning Article	Selective Filtration
2 BAT UK	2 BAT GmbH
On-Line Control of Tipping Paper	Packaging
1 BAT GmbH	1 BAT GmbH
CO2 Extraction of Alkaloids	Extruded Rod
1 BAT GmbH	1 BAT UK
Perforated Wrappers	Humidor Pack
1 B&W	1 B&W
On-Line Control of Ventilation	Reconstituted Tobacco
1 BAT UK	1 BAT UK
Pectin Adhesive	QA Devices
1 BAT GmbH	1 BAT GmbH
Cigarette Rolling Device	Moisture Indicating Ink
1 BAT GmbH	1 B&W
	Clock Security Device
	1 B&W

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establish a defensive position in areas being actively worked on by their competitors, i.e., Premier and low sidestream cigarettes. They also seem to be increasing their involvement in all aspects of tobacco processing including primary processing, reconstitution and expansion. The remainder of these patents cannot be easily categorized. BAT's technological output warrants close monitoring during the coming year.

As mentioned previously, Brown & Williamson publishes very little, although the BAT laboratory in Southampton does publish a number of papers. In the past twelve months there has only been a single publication originating from B&W. The subject of this paper, numerical predictions for a simulated methane fire, suggests that the work was done elsewhere but published after one of the authors was employed by Brown & Williamson. This appears likely in that only one of the four authors is definitely on the technical staff at B&W.

6. Technology Products

Brown & Williamson has not introduced any products utilizing new technology in the United States during the past twelve months. They continue to patent actively in a number of product areas, particularly low sidestream cigarettes and non-conventional smoking articles, but these patents appear to represent a defensive strategy as opposed to an offensive strategy.

7. Strengths and Weaknesses

Brown & Williamson's R&D Department is less than half the size of the PM USA Research Center. As such they are less able to commit resources to the development of new technology products and processes than is either PM USA or RJR Tobacco. Although the combined total tobacco related R&D resources of BAT may be equivalent to PM USA, there is probably considerable overlap in areas of expertise which prevents full utilization of their resources. BAT tends to have considerable strength in the process development and engineering areas, including the development of improved manufacturing equipment, QA inspection devices, on-line monitoring devices, and process modifications. Despite their relatively small size, they are quite opportunistic and can continue to compete with companies with greater technological resources by rapidly analyzing new technologies developed by their competitors and changing them sufficiently to give them a proprietary position.

It has been noted previously that their product patents appear to be defensive in nature. Despite this fact, their patents can provide considerable problems for PM

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USA because many of them have been written in extremely broad terms which are likely to result in patent interferences with inventions we develop. For example, they now hold a large number of patents in the low sidestream area. The actual work described in these patents is not particularly novel, and in many cases it is likely that the inventions described would not work well. The claims to these patents are written in such a way to cover many variations around the invention. Brown & Williamson has indicated a willingness to be litigious in the past, and there is every reason to expect that this will continue. To have the best chance of ensuring that they cannot prevent us from practicing our own inventions, we must maintain an aggressive patent policy ourselves, and ensure that we understand those areas in which we are competing far better than they do.

8. Conclusions

B&W no longer has a dominant full margin brand. Kool, still their largest brand, has declined significantly during the last several years. Although Capri appears to be growing in 1991, its market share is only 0.5%. Both Belair and Barclay appear to be declining almost to the vanishing point. B&W has been able to increase their price value business during 1991 through a significant growth in their generics, at the expense of Liggett, and the repositioning of Raleigh Extra as a third tier brand. Market share of Raleigh Extra was 1.0% after the first six months of 1991. Nevertheless, it would appear unlikely that we would choose to compete directly with B&W because of the weakness of their full margin brands.

Brown & Williamson is continuing to build its export business. They have the highest percentage of exported cigarettes, 39%, of any of the domestic cigarette companies. This compares to 31% for Philip Morris and 19% for RJR. They are doing an excellent job in expanding this area of their business. Number of cigarettes exported grew 16.6% between 1990 and 1991. This is considerably less than PM's 22.8% growth in the same period, but is superior to RJR's 13.6%. Unlike PM, which exports the majority of its cigarettes to the Far East, B&W appears to export as many cigarettes to the Gulf Coast Countries as to the Far East.

D. JTI

1. Highlights

After several years of significant growth by the import segment in Japan, dominated by brands exported by PM USA, and characterized by numerous new product introductions from both JTI and foreign companies, this segment appears to be

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plateauing. Growth of the import segment was only 0.9% during 1990 compared to 13.9% for 1989 and 12.2% for 1988. Although it would appear that some of the decline in growth of imported brands is due to the fact that their novelty may have worn out, much of the reason can be attributed to the activities of JTI itself. They remain a formidable competitor.

JTI has been extremely active in the past several years in introducing both line extensions of their successful brands as well as new brands. It would appear that this trend is also changing. JTI introduced six new packings in the past twelve months; however, only two of these were introduced in the first six months of 1991. JTI has also addressed their lack of box packers recently. They are in the process of acquiring 19 new box packers which should allow them to increase significantly their production of this popular form of packaging.

JTI is also concentrating on increasing their own exports. Export volume in 1990 was 7.2 billion units, and projected export volume for 1991 is estimated at about 8.1 billion units. Most of JTI's exported cigarettes go to East Asian countries. One East Asian country that JTI cannot export to directly is Taiwan. JTI recently licensed the Swiss cigarette manufacturer Rinsoz & Ormond to produce 1800 cases of both Mild Seven and Seven Stars cigarettes for export into Taiwan. (It should be noted that although JTI cannot export directly into Taiwan, smuggled Japanese cigarettes make up about 50% of the import market in Taiwan.) International marketing plans had called for further penetration of Middle Eastern markets, but the war in the Gulf delayed this action. JTI has also cast an eye to Eastern Europe. Exports to the United States and West European countries are hampered, according to Katsuhiko Yamasaki, general manager of international planning, "because cigarettes are a product of image, and it takes a long time to penetrate these markets with image promotions." JTI is making small-scale efforts to sell to Asian nationalities in the United States, especially in California and the New York/New Jersey areas.

JTI is continuing with its diversification program. During fiscal 1990 the firm extended its food and beverage operations, and began manufacturing and selling vending machines. Two subsidiaries were established: JT Kokubu Ltd., a food products distribution firm, and JT Nifco Co., Ltd., which is involved in industrial plastics production. Other fields of diversification are: pharmaceuticals; agribusinesses (including the Hydroponics Development Center); food and soft drink production; and real estate - particularly fitness centers, hotels, restaurants and urban redevelopment projects.

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JTI has extended its involvement in the biotechnology area by entering into a worldwide joint venture agreement in June, 1991, with Cell Genesys, Inc., a privately owned US biotechnology company, through its wholly owned subsidiary, JT Immunotech USA. Under this agreement Cell Genesys will receive up to \$30 million for a minority equity investment and funding support of company R&D. In addition a 50-50 joint venture will be established to develop and commercialize pharmaceutical products based on human monoclonal antibodies. Mycogen, a US biotech firm partly owned by JTI, recently announced the first EPA approval for two genetically engineered microbial pesticides. The genetically engineered products, M-One Plus and MVP, will be used to control beetles, such as the Colorado potato beetle, and caterpillar pests, including those found on a wide variety of vegetable, fruit, and ornamental crops. According to the current agreement between JTI and Mycogen, JTI will receive 25% of the revenue from these products sold in the US, 75% of the revenue from sales in Japan, and 50% derived from sales in the remainder of the world.

JTI also recently signed contracts with British Biotechnology Limited (BBL), a UK venture business, to introduce technologies dealing with a cholesterol synthesis inhibitor in June, and TPA in December of 1990. These two genetically engineered drugs hold promise, and their annual sales are estimated to reach over \$70 million each. JTI's target is to market them a decade later. Since JTI owns 10% of BBL's stake, it will be able to continue to introduce promising drugs hereafter.

JTI is heavily involved in developing its pharmaceutical business. The company established a joint venture, Lifix, with Yoshitomi Pharmaceutical (55% owned by JTI and the remaining share owned by Yoshitomi) in April, 1988, and started marketing over the counter drugs and health-related products. Currently, JTI has four new drugs under joint development with Yoshitomi. JTI's first ethical drug will likely be marketed in 1993, if everything goes according to schedule. Moreover, the company is estimated to have several items which are awaiting clinical tests and are presently in the research stage. JTI has the marketing rights on the jointly developed drugs. Thus, the company is preparing to set up sales channels in accordance with starting up sales of these new drugs in the future.

JTI has entered into an agreement with Egis Pharmaceuticals, the third largest Hungarian drug company. JTI is spending \$10 million, half of Egis' investment, for the construction of a new pharmacology center, and will acquire exclusive rights on R&D activities, manufacturing and marketing in 42 Asian countries including Japan during the next 15 years. Whenever JTI introduces any specific technology from Egis, it has an individual licensing contract.

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On the tobacco side, JT Engineering is presently constructing a primary processing plant in China. Market potential in China is, of course, huge, and JTI is interested in attempting to obtain a foothold.

2. New Product Introductions

JTI introduced the following new products in Japan during the twelve month period between July 1, 1990, and June 30, 1991.

- a. Mild Seven Special Lights King Size cigarettes were introduced in July, 1990, in a box packing. This 84 mm brand delivers 10 mg tar and 0.8 mg nicotine.
- b. Claris Lights King Size Menthol cigarettes were introduced in August, 1990, in a box packing. This 84 mm product delivers 8 mg tar, 0.7 mg nicotine, and 0.2 mg smoke menthol.
- c. Cabin Super Mild King Size cigarettes were introduced in September, 1990, in a box packing. This 84 mm product delivers 7 mg tar and 0.6 mg nicotine.
- d. Caster Bevel 100 cigarettes were introduced in September, 1990, in a box packing. This product delivers 9 mg tar and 0.8 mg nicotine.
- e. Stingray King Size Soft Pack cigarettes were introduced in January, 1991. This product delivers 11 mg tar and 0.9 mg nicotine.
- f. Sometime Lights King Size Menthol 20's were introduced in Japan in April, 1991, in a box packing. This 84 mm product delivers 10 mg tar, 0.7 mg nicotine, and 0.5 mg smoke menthol.

During the same period of time Philip Morris introduced four new brands, Virginia Slims Lights 100 Menthol SP, Philip Morris Lights King Size Box, Lark 100 Box, and Lark Milds King Size Box 14 Pack; Brown & Williamson introduced four new brands, Kent King Size Box, Kent Special Milds King Size Box, Lucky Strike Milds King Size Box, and Kool King Size Menthol Box; American Tobacco Company introduced two brands, American Super Lights King Size Box and American Lights King Size Box; The Liggett Group introduced Omni Blue Milds 100 SP; The London Tobacco Company introduced two brands, Hyde Park King Size Box and First Mild King Size Box; F. J. Burrus introduced Match 501 King Size Box; Rothmans introduced Dunhill Special Lights

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King Size Box; and the Kunming Cigarette Factory, China, introduced San Chi Gold King Size Box. No new brands were introduced by R. J. Reynolds.

3. R&D Organization

There has been no change that we are aware of regarding JTI's R&D organization. As was discussed last year they have eleven separate R&D laboratories covering a wide range of endeavors. The fact that these laboratories are actively pursuing research is indicated by the fact that publications have originated from nine of these labs during the past twelve months. The Life Science Research Laboratories have the vast majority of these with 25 publications. The remainder of those laboratories with publications are: Tobacco Science Research Laboratory, four publications; Central Research Institute, three publications; Plant Breeding and Genetic Research Laboratory, two publications; and one publication each from the Plant Research Laboratory, the Sea Water Research Laboratory, the Pharmaceutical Research Laboratory, the Engineering Research Institute, and the Toxicology Research Laboratory. In addition there were three publications jointly published by at least two laboratories.

JTI does plan to increase its R&D activity devoted to pharmaceutical and biotechnology research, however. The company plans to build a basic research center in the Kanazawa Biopark in Yokohama in the spring of 1992. Furthermore, JTI plans to expand the pharmacy lab in Yokohama and construct their most advanced facility in their factory site in Osaka. In the future the Yokohama lab will be transferred to Osaka.

In addition to increased capital spending for R&D, JTI is also sharply increasing its R&D budget. It is estimated that R&D expenses will be \$175 million in fiscal 1991 up from \$130 million in fiscal 1990.

4. Patents and Publications

JTI continues to patent actively. The total number of patents obtained in the twelve month period from July 1, 1990, to June 30, 1991, was 39, four more than they obtained in the comparable period one year ago. There was a significant difference in the mix of patents. In the previous twelve month period they obtained fewer US patents and more Japanese patents than in the comparable period last year. The distribution for the past twelve months was 11 US patents, 9 European Patent Office Publications, and 19 Japanese patents.

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The largest single category of JTI patents is packaging engineering. Three patents disclose improved and/or modified equipment for cigarette manufacturing, and two patents improved and/or modified equipment for filter manufacturing. Consequently, almost half of JTI's patents involve areas where PM USA R&D is not particularly active. Three patents cover aspects of capsules containing a liquid (unspecified) which can be placed in a cigarette filter. This technique could potentially be used in a product utilizing new technology; however, to date JTI has only marketed a product utilizing this technology in the Gulf Coast countries. The remainder of JTI's patents are distributed over a rather large number of topics ranging from organic synthesis to tobacco harvesting. A complete listing of JTI's patents obtained during the past twelve months is given in Table 7.

There are several JTI patents which should be noted because they involve technology in which PM USA R&D has some interest. US 5,020,550 discloses an apparatus for expanding material of an agricultural origin, including tobacco. This apparatus utilizes gaseous carbon dioxide as the expansion medium, and the key technology being claimed appears to be equipment which allows pressure to be equalized within the equipment both during impregnation and expansion. EP 426,069 discloses an apparatus for laser perforation of tipping paper. The improvement over existing technology involves the use of beam splitters to provide a number of rows. JP 02-152,642 discloses equipment which can be used to automatically remove cigarettes from packs. PM USA has also developed technology in this area. Finally, JP 02-203,775 covers the use of glucose esters as tobacco taste and fragrance improvers.

The number of publications issued from JTI during the past twelve months, forty-two, is almost exactly the same as were issued in the previous twelve month period, forty-three. The vast majority of their publications are in the research area, and most of them can be classified broadly as involving either biochemistry or organic chemistry. A specific listing is as follows: organic chemistry, eleven; toxicology, six; biochemistry, five; molecular biology, four; plant biochemistry, four; entomology, three; enzymology, two; and one each in membrane separations, computer applications, smoke chemistry, plant genetics, polymer chemistry, tobacco chemistry, and X-ray crystallography. It is interesting to note the virtual absence, with the exception of the last paper, of publications in the area of analytical chemistry. It also should be noted that the research being reported from the JTI Laboratories is of the highest quality.

JTI collaborates extensively with university research departments. Not unexpectedly, the majority is with Japanese universities. The publications from the

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Table 7
JTI Patents from July 1, 1990, to June 30, 1991

Packaging Engineering 7 Japanese Patents	Cigarette Manufacturing Equipment 1 US Patent 2 EPO Publications
Filter Manufacturing Equipment 1 US Patent 1 EPO Publication	Liquid Capsules for Filters 2 EPO Publications 1 Japanese Patent
Organic Synthesis 3 US Patents	Insect Pheromones 2 US Patents
Tobacco Curing 2 Japanese Patents	Control System for Make-Pack 1 US Patent
Expanded Tobacco 1 US Patent	Tobacco Flavorants 2 Japanese Patents
Recovery of Cigarettes from Pack 1 Japanese Patent	Method for Detecting Ventilation 1 EPO Publication 1 Japanese Patent
Plant Virus Controlling Agent 1 EPO Publication	Agricultural Equipment 2 Japanese Patents
Loop Control Apparatus 1 US Patent	Moisture Measurement Apparatus 1 US Patent
Laser Perforating 2 EPO Publications	Smokeless Tobacco Article 1 Japanese Patent
Laminated Tobacco Sheets 1 Japanese Patent	Tobacco Fertilizer 1 Japanese Patent

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past twelve months show collaboration with nine universities in Japan, many of them on more than one publication, and one Japanese company. In addition, however, there are two papers which listed individuals from Vanderbilt University as co-authors, and one paper which was co-authored by individuals from the Karolinska Institute in Stockholm, Sweden.

5. Strengths and Weaknesses

JTI has set up an extremely large research organization staffed by excellent personnel. They are extremely strong in the areas of biochemistry, genetics, toxicology, molecular biology, organic chemistry, entomology, and engineering. They also clearly have strengths in the area of both cigarette product and process development. If there is a weakness which can be exploited by PM USA, it is that they do not appear to be strategically committed to the application of new technology in their cigarette business. They have chosen to develop new technologies in a number of different areas - such as pharmaceuticals, agricultural chemicals, food and beverages, and improved plants - to grow the business in directions other than tobacco. They appear to be competing in the cigarette end of the business through the introduction of conventional products which have small market niches, and through skillful marketing of these products both in Japan and elsewhere. To the extent that PM USA can introduce products with new technologies into Japan, JTI will be vulnerable.

6. Conclusions

JTI remains a formidable competitor in Japan, and may become a formidable competitor in other parts of the world. Although there is every indication that their long term strategy is through diversification, they have no intention of abandoning their cigarette business. As was pointed out above, the best approach to competing with them in Japan is through the introduction of products with new technologies which address consumer needs in Japan. JTI clearly has the resources to match any technologies we are likely to develop and commercialize. However, since they have adopted a defensive posture, it would take a significant period of time before they were in a position to market a new technology product. This time period would provide a significant opportunity for PM USA.

Concern has often been expressed that JTI may increase its access to the US or elsewhere within the world through the purchase of either a US cigarette company or the export business of a US cigarette business (most likely RJR). There is no question that JTI could do so if it decided to. There is considerable reason to

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predict that they will not do so. As already discussed, JTI is pursuing a well-thought-out policy of expansion through the creation of new businesses, both high-tech and otherwise. They are now the third largest biotechnology company in Japan. They have shown no interest in doing anything else with their cigarette business other than maintaining market share in Japan, and expanding their exports at a rate of 20% per year. It is extremely unlikely that they will deviate from this strategy. JTI does not move quickly. Once they have adopted a course of action, they will move to accomplish it in a thorough and deliberate manner. They remind one of the old Green Bay Packers when they were coached by Vince Lombardi. The opposing coach always knew what the Packers were going to do; however, that knowledge was of little help because they did it so well. We should not anticipate any surprises from JTI. However, we should be aware that whatever they plan to do, they will do well.

E. American Brands

1. New Products

American Brands continues to be active with respect to the introduction of both price value and sub-generic products. The following packings were introduced during the last twelve months.

a. Misty Lights 100 and Misty Lights 100 Menthol cigarettes were introduced nationally in the first quarter of 1991 in a box packing. These products had previously been in test market in California and Louisiana. Both packings deliver 8 mg tar and 0.7 mg nicotine, and the menthol packing delivers 0.5 mg smoke menthol. These products are being marketed as price value brands.

b. Montclair King Size Regular and Montclair Lights King Size Regular and Menthol cigarettes were introduced nationally in the first quarter of 1991. The regular version of Montclair King Size delivers 16 mg tar and 1.2 mg nicotine. Montclair Lights King Size Regular and Menthol both deliver 12 mg tar and 0.9 mg nicotine. The menthol cigarette delivers 0.6 mg smoke menthol. These brands sell at sub-generic prices.

c. Bull Durham King Size and Bull Durham Lights King Size cigarettes were introduced nationally in the second quarter of 1991 in box packings. These cigarettes were in test market from September, 1990, until March, 1991. The Full Flavor packing delivers 16 mg tar and 1.2 mg nicotine, while the Lights

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packing delivers 10 mg tar and 0.8 mg nicotine. These brands sell at sub-generic prices.

Misty is doing well in the market place given its recent introduction date with a 0.6 market share. Bull Durham, on the other hand, only has a 0.2 market share. The Montclair family, which now has seven packings, is selling quite well. Second quarter market share has increased to 1.3 from 0.6 in the second quarter of 1990.

2. Market and Financial Data

American Brands' overall performance in the first half of 1991 has been quite good. Total volume has increased by 2.3% as compared to the same period in 1990. This represents a 0.3 increase in market share. American is unique among the six domestic tobacco companies in that 26% of their business is still derived from non-filtered brands. Pall Mall non-filter is their second largest brand. The comparatively large volume derived from non-filters is of considerable advantage to American in that there are virtually no marketing expenses associated with these brands and they are not couponed. Consequently, they provide a significant source of profit. American's largest selling brand is Carlton, an ultra low tar brand. Carlton, like virtually all other full margin brands, has declined in sales during the first half of 1991 compared to the first half of 1990. However, its decline, 8.8%, is considerably less than most other full margin brands. American's remaining full margin business has declined by 23.4%. American's price value business, on the other hand, has significantly increased. Total price value products increased by 77.9% over the same period. In addition to the new product introductions mentioned above, American repositioned all five Lucky Strike filter packings in a number of markets. This brand is being sold at generic prices in Arkansas, Louisiana, Mississippi, and Tennessee; and at sub-generic prices in Des Moines, Iowa. It is likely that this brand will be sold at generic prices nationally in the near future.

American Brands' market place success is also reflected in their financial position. Total revenues increased by 10.4% for the first six months of 1991 compared to the first six months of 1990, while net income increased by 12.6% over the same period of time. The majority of the increase in revenue can be attributed to American's tobacco business.

American Brands's direct export business is quite small comprising only 3.5% of their total domestic production. In addition, they are the only domestic cigarette company involved in the export market which showed a decline in exports

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(13.3%) between 1989 and 1990. Clearly they are not aggressively pursuing export business. On the other hand, American Brands owns Gallaher in the United Kingdom. Gallaher Tobacco is the leading tobacco company in the UK and has been performing well. For 1990, Gallaher increased its unit sales by 3.2% compared to 1990, and increased market share from 44 to 45%. Gallaher Tobacco's sales accounted for 58% of American Brands' consolidated cigarette unit sales in 1990. Gallaher is quite active with regard to export sales, and showed an increase in export unit sales of 18% between 1990 and 1989.

3. R&D Organization

American Brands' R&D Laboratory, located in Hopewell, Virginia, is relatively small. The 1990 edition of the "Directory of American Research and Technology" cites a total size for their Research Center of 140 which includes 60 professionals, 11 of whom have doctorates, and 80 technicians and auxiliaries. It is worthwhile noting that although the total size of their laboratory is about two-thirds the size of B&W's, they have only about one-third as many professionals. The small number of professionals employed by American clearly illustrates their inability to compete with PM with respect to new technology.

The American R&D Center is headed by Richard D. Chumney, Jr., who replaced Preston Leake when he retired, in June, 1991. Chumney was formerly Director, New Products. The only other management personnel we have identified at American Brands R&D are Byron F. Price, Director of Research; Dallas O. Pinion, Manager, Research & Technical Services; and William T. Pannell, Manager, Analytical Services. All of these individuals were promoted to their present positions in March, 1991.

Attachment 3 contains a list of 38 individuals identified by name which we have identified as being employed at American Brands' R&D Laboratory. We do not have sufficient information to be able to classify these individuals into any kind of organizational structure.

4. Patents & Publications

Neither American nor Gallaher are active regarding patents and publications. In the twelve month period between July 1, 1990, and June 30, 1991, American Brands has one issued US Patent and Gallaher also has one issued US Patent. The American Patent, US 5,007,439, describes a method for controlling the tar delivery of a non filter cigarette using a tandem arrangement of two tobacco columns which can be varied in tobacco composition. The Gallaher patent, US 4,934,125, discloses a method

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for transporting a block of tobacco using a new type of container. Neither of these patents is of interest to PM USA.

American has had no publications or presentations in the same twelve month period referred to above.

5. Conclusions

As has been pointed out before, American Brands does not have the R&D capability to compete with PM USA in technology. On the other hand, we should be developing new products to compete with American in the market place. The majority of American's full margin business consists of three brands, Carlton, Pall Mall non filter, and Lucky Strike non filter. We need two types of products to compete with Carlton: 1) a subjectively improved 1 mg King Size and 2 mg 100 cigarette which can be sold as a full margin product; and 2) a "standard" 1 mg King Size and 2 mg 100 cigarette which can be sold at generic prices. The objective of the first product is satisfied by Merit Ultima. PM USA R&D has completed its product development for this product, and a national introduction is planned for the first quarter, 1992. The second product has already been launched; namely, Cambridge and Bristol Lowest. PM USA R&D's remaining responsibility for these cigarettes is to reduce their cost.

As far as a product to compete with American's non filter business, plans are in place to introduce PM Commanders as a generic brand. It would probably also be worth while to market a second generic, or third tier non-filter brand, with a different marketing image.

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Environmental Regulations

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FEDERAL (34 Laws)

The National Environmental Policy Act
Comprehensive Environmental Response, Compensation and Liability Act
Emergency Planning and Community Right-to-Know Act
Clean Air Act
Energy Supply and Environmental Coordination Act
Radon Research and Indoor Air Research Act
Resource Conservation and Recovery Act
Federal Water Pollution Control Act
Water Resources Planning Act
Safe Drinking Water Act
Federal Environmental Pesticide Control Act
Soil and Water Resources Conservation Act
Water Resources Research Act
Toxic Substances Control Act
Oil Spill Prevention Act
Occupational Safety and Health Act
EPA's New Source Performance Standards
EPA's National Emission Standards for Hazardous Air Pollutants
EPA Stratospheric Ozone Protection Regulations
EPA Regulations for Assessment and Collection of Noncompliance Penalties
EPA National Pollutant Discharge Elimination System Permit Regulations
EPA Regulations on Designation of Hazardous Substances
EPA Regulations on Determination of Reportable Quantities for Hazardous Substances
EPA Regulations on Criteria and Standards for the National Pollutant Discharge Elimination System
EPA National Primary Drinking Water Regulations
EPA National Secondary Drinking Water Regulations
EPA Toxic Pollutant Effluent Standards
EPA General Provisions for Effluent Guidelines and Standards
EPA General Regulations for Hazardous Waste Management
EPA Regulations for Identifying Hazardous Waste
EPA Regulations for Hazardous Waste Generators
EPA Regulations for Hazardous Waste Transporters
EPA Regulations for Owners and Operators of Permitted Hazardous Waste Facilities
EPA Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks
EPA Regulations on Approval of State Underground Storage Tank Programs

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VIRGINIA (20 Laws)

Virginia Air Pollution Control Laws
Virginia Environmental Quality Act
Virginia Air Pollution Control Law
Virginia Air Pollution Control Regulations
Virginia Litter Control and Recycling Act
Virginia Waste Management Act
Virginia Underground Storage Tanks Act
Virginia Hazardous Materials Emergency Response Act
Virginia Solid Waste Regulations
Virginia Hazardous Waste Management Regulations
Virginia Fees for Hazardous Waste Facility Site Certification
Virginia Rules for Hazardous Waste Facility Site Certification
Virginia Financial Assurance Rules for Solid Waste Facilities
Virginia State Water Control Law
Virginia Environmental Impact Report Law
Virginia Water Pollution Control Regulations
Virginia Discharge Permit Regulations
Virginia Water Quality Standards
Virginia Chesapeake Bay Preservation Act
Virginia Department of Commerce Asbestos Removal Licensing Act

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NORTH CAROLINA (13 Laws)

North Carolina Water and Air Resources Acts
North Carolina Environmental Policy Act
North Carolina Air Pollution Control Laws
North Carolina Air Pollution Control Regulations
North Carolina Solid and Hazardous Waste Management Act
North Carolina Comprehensive Environmental Response Act
North Carolina Solid Waste Management Regulations
North Carolina Hazardous Waste Management Regulations
North Carolina Area Management Act
North Carolina Oil Pollution and Hazardous Substances Control Act
North Carolina Water Pollution Control Regulations
North Carolina Water Quality Standards
Rocky River Treatment Plant Discharge Regulations

KENTUCKY & JEFFERSON COUNTY (12 Laws)

Kentucky Environmental Protection Law
Kentucky Air Pollution Control Regulations
Kentucky Solid Waste Law
Kentucky Underground Storage Tanks Laws
Kentucky Waste Management Regulations
Kentucky Waste Discharge Regulations
Kentucky PDES Permitting Program Regulations
Kentucky Spills Regulations
Kentucky Biochemically Degradable Wastes Regulation
Kentucky Water Quality Standards
Jefferson County Air Pollution Control Regulations
Jefferson County Metropolitan Sewer Discharge Regulation

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GOVERNMENTAL REGULATIONS AND RESTRICTIONS

• EPA report on ETS

Summary

Draft report states that involuntary exposure to tobacco smoke causes lung cancer in non-smokers and increases risk of respiratory illness in children. It also states that ETS should be classified as a known human carcinogen, and that workplace smoking policies should reflect the hazard.

Issue

- Companies will ban smoking on the job rather than revamp air handling systems.
- Without report smoking restrictions continue to increase:
 - 26 states and 300 localities have enacted restaurant no smoking policies
 - 28 states and 300 localities have laws surrounding workplace smoking
 - 60% of US companies restrict smoking (16% in 1980)

• Ignition Propensity

Summary

The Fire Safe Act of 1990 is now law. The law requires the Consumer Product Safety Commission (CPSC) to direct the National Institute of Standards and Testing (NIST) to develop a standard method of testing ignition propensity, compile data using the method, and develop predictive models. The CPSC will also collect data on cigarette characteristics, products ignited, and smokers involved in fires. NIST will have developed a standard test method to determine ignition propensity by the end of 1992.

Issue

- Industry input into development of the test method.
- Changes to current and new products to meet standards developed.

• Marketing Restrictions

Summary

Marketing restrictions possible are banning or restricting outdoor and point of sale advertising, prohibiting sampling, and severely restricting vending machine sales. proponents of these restrictions use the youth and smoking issue to advance their legislative agenda.

Issue

- 1 state and 11 localities restrict outdoor advertising. 29 bills are pending.
- Ban continues under appeal in Canada. Efforts in the EEC derailed despite heated debate.
- 4 states ban or restrict sampling as do 29 municipalities.
- 8 states enacted vending machine legislation.
- Restrictions on the sale of tobacco products, primarily vending, were proposed in 133 localities in 1990 and adopted in 56.
- 44 states impose a minimum age of from 16-19 for the sale of cigarettes.

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GOVERNMENTAL REGULATIONS AND RESTRICTIONS

• Kennedy Bill

Summary

Officially known as the Tobacco and Health Protection Act of 1991. The bill recommends that a Center for Tobacco Products be established and funded with \$75 million for anti-smoking counter advertisements and to fund state enforcement of minimum age and vending machine laws. Also recommended is a requirement that companies disclose on packages or in package inserts, tar, nicotine, and carbon monoxide levels as well as ingredients labeling and increase the warning label to 20% of the panel space, both front and back. The bill has been referred back to committee and will not be acted on in 1991.

Issue

- The bill will further fund the anti-smoking movement
- Disclosure of product ingredients may influence changes in product design
- The ability to create attractive packaging could be limited.

• Ingredients

Summary

This is primarily an International issue surrounding the adoption of EEC regulations following harmonization in 1992. The most likely scenario is that the current German regulations would be adopted with minor modification or revision. This regulation requires a 5% limit on specified humectant and provides a list of authorized additives. Other alternatives are that each country will develop separate restrictions or that a list of permitted substances would be developed.

Issue

- Possible changes in cigarette components/ingredients to meet restrictions
- Ability to maintain current subjectives with changes.

• Work Place Discrimination

Summary

In the past several years there have been a number of companies and municipal agencies which have prohibited their employees from smoking off the job.

Issue

- 3 states have enacted laws permitting employers to discriminate in hiring government employees
- 18 states have enacted employment protection against legislation.

• Excise Taxes

Summary

State excise taxes will continue to increase due to two factors. The first is that the anti-smoking movement which has made excise taxes an important part of their agenda. The second factor is the poor financial health of many states.

Issue

- The budget accord of 1990 calls for a \$2.00 per thousand federal excise tax increase to \$12.00 per thousand in 1993. No further increases are anticipated through 1996.
- Due to a consumer price ceiling, tax increases reduce our margins or if passed to the consumer increases switching to price/value.

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GOVERNMENTAL REGULATIONS AND RESTRICTIONS

• Liability Suits

Summary

The Cipollone case regarding whether the warning label can be regarded as federal preemption will be reconsidered during 1992 by the federal supreme court.

Issue

- Loss of the case could result in increased suits and negative publicity.

• International Tar and Nicotine Levels

Summary

Countries which have passed such legislation are restricted to the Middle East and the Pacific Rim. In 1993, the first round of Tar ceilings will go into affect in the EEC. This legislation will limit all cigarettes sold in the EEC to deliver no more than 15 mg ISO tar. A second ceiling will be enacted in 1998 limiting the ceiling to 12 mg ISO tar.

Issue

- Considerable work will be needed so that PMI products can meet this ceiling without impairing subjectives.

• Smokers' and Non-smokers Attitudes

Summary

A smoker segmentation study suggests that smokers' attitudes are heavily influenced by nonsmokers' opinions and actions, which are becoming less favorable toward the industry.

Issue

- Cigarettes which meet the desires of smokers, while accommodating non-smokers such as low sidestream products could provide potential volume gains, although these types of products have unsuccessful to date.

• Clean Air Act

Summary

Enacted in 1990, this law has two aspects of critical importance. First is that permits will have to be renewed periodically. Secondly, as part of the Act, the EPA will phase in the Federal Air Toxics Program. This program, due to take effect in 4-5 years, will take 186 chemicals that were previously non criteria pollutants and put limits on them.

Issue

- Source reduction of pollutants may require product changes.

• National Pollution Discharge Elimination System

Summary

Effects Park 500 and the Manufacturing Center. Tighter State water quality standards, such as, expanding the list of chemicals monitored and lowering the concentration of those already monitored.

Issue

- Source reduction of pollutants may require product changes.

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